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		replac$4 same identify$4 same ((broken or dead) adj2 link$) and source and	

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☐	L17	L16 and client and server	16

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1 METHOD AND APPARATUS FOR DETERMINING AND RESOLVING MISSING TOPOLOGY FEATURES OF A NETWORK FOR IMPROVED TOPOLOGY ACCURACY

Inventor: TO HING WING; APPLETO CHRISTOPHER **Applicant:** MICROMUSE LTD (GB)

EC: H04L12/56C1 **IPC:** ***H04L12/56***; **H04L12/56**; (IPC1-7): H04L12/00

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1 Measuring ISP topologies with rocketfuel

Neil Spring, Ratul Mahajan, David Wetherall
August 2002 **ACM SIGCOMM Computer Communication Review , Proceedings of the 2002 conference on Applications, technologies, architectures, and protocols for computer communications SIGCOMM '02**, Volume 32 Issue 4
Publisher: ACM Press

Full text available: pdf(1.21 MB) Additional Information: full citation, abstract, references, citings, index terms

To date, realistic ISP topologies have not been accessible to the research community, leaving work that depends on topology on an uncertain footing. In this paper, we present new Internet mapping techniques that have enabled us to directly measure router-level ISP topologies. Our techniques reduce the number of required traces compared to a brute-force, all-to-all approach by three orders of magnitude without a significant loss in accuracy. They include the use of BGP routing tables to focus the ...

2 Measuring ISP topologies with rocketfuel

Neil Spring, Ratul Mahajan, David Wetherall, Thomas Anderson
February 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 1
Publisher: IEEE Press

Full text available: pdf(732.86 KB) Additional Information: full citation, abstract, references, index terms, review

To date, realistic ISP topologies have not been accessible to the research community, leaving work that depends on topology on an uncertain footing. In this paper, we present new Internet mapping techniques that have enabled us to measure router-level ISP topologies. Our techniques reduce the number of required traces compared to a brute-force, all-to-all approach by three orders of magnitude without a significant loss in accuracy. They include the use of BGP routing tables to focus the measurem ...

Keywords: communication system operations and management, internet, measurement, network reliability

3 Topology management for improving routing and network performances in mobile ad hoc networks

Navid Nikaein, Christian Bonnet

December 2004 **Mobile Networks and Applications**, Volume 9 Issue 6
Publisher: Kluwer Academic Publishers
Full text available: pdf(1.03 MB) Additional Information: full citation, abstract, references, index terms

A distributed topology management algorithm based on the construction of a forest from the topology of the network is proposed. In this algorithm, each tree of the forest forms a zone, and each zone is maintained proactively. As a result, the network can be seen as a set of non-overlapping zones. We introduce the concept of quality of connectivity for extracting the links connecting the pair of best nodes, and use this quality to construct the forest. We characterize the behaviors of the prop ...

Keywords: architecture, mobile ad hoc networks, network topology, performance evaluation, simulation, topology management

4 Restoration by path concatenation: fast recovery of MPLS paths
Anat Bremler-Barr, Yehuda Afek, Haim Kaplan, Edith Cohen, Michael Merritt
August 2001 **Proceedings of the twentieth annual ACM symposium on Principles of distributed computing**
Publisher: ACM Press
Full text available: pdf(830.71 KB) Additional Information: full citation, abstract, references, index terms

A new general theory about *restoration* of network paths is first introduced. The theory pertains to restoration of shortest paths in a network following failure, e.g., we prove that a shortest path in a network after removing k edges is the concatenation of at most $k + 1$ shortest paths in the original network.

The theory is then combined with efficient path concatenation techniques in MPLS (multi-protocol label switching), to achieve powerful schemes for restorati ...

5 High-speed local area networks and their performance: a survey
Bandula W. Abeysundara, Ahmed E. Kamal
June 1991 **ACM Computing Surveys (CSUR)**, Volume 23 Issue 2
Publisher: ACM Press
Full text available: pdf(3.83 MB) Additional Information: full citation, abstract, references, citings, index terms, review

At high data transmission rates, the packet transmission time of a local area network (LAN) could become comparable to or less than the medium propagation delay. The performance of many LAN schemes degrades rapidly when the packet transmission time becomes small comparative to the medium propagation delay. This paper introduces LANs and discusses the performance degradation of LANs at high speeds. It surveys recently proposed LAN schemes designed to operate at high data rates, including the ...

Keywords: access schemes, computer networks, data communication, medium access protocols, optical fiber networks

6 Factors in the performance of the AN1 computer network
Susan S. Owicki, Anna R. Karlin
June 1992 **ACM SIGMETRICS Performance Evaluation Review , Proceedings of the 1992 ACM SIGMETRICS joint international conference on Measurement and modeling of computer systems SIGMETRICS '92/PERFORMANCE '92**, Volume 20 Issue 1
Publisher: ACM Press
Full text available: pdf(1.32 MB) Additional Information: full citation, abstract, references, citings, index terms

AN1 (formerly known as Autonet) is a local area network composed of crossbar switches interconnected by 100Mbit/second, full-duplex links. In this paper, we evaluate the performance impact of certain choices in the AN1 design. These include the use of FIFO input buffering in the crossbar switch, the deadlock-avoidance mechanism, cut-through routing, back-pressure for flow control, and multi-path routing. AN1's performance goals were to provide low latency and high bandwidth in a lightly loa ...

7 Network topology generators: degree-based vs. structural

Hongsuda Tangmunarunkit, Ramesh Govindan, Sugih Jamin, Scott Shenker, Walter Willinger
August 2002 **ACM SIGCOMM Computer Communication Review , Proceedings of the 2002 conference on Applications, technologies, architectures, and protocols for computer communications SIGCOMM '02**, Volume 32 Issue 4
Publisher: ACM Press

Full text available: pdf(271.45 KB) Additional Information: full citation, abstract, references, citings, index terms

Following the long-held belief that the Internet is hierarchical, the network topology generators most widely used by the Internet research community, Transit-Stub and Tiers, create networks with a deliberately hierarchical structure. However, in 1999 a seminal paper by Faloutsos et al. revealed that the Internet's degree distribution is a power-law. Because the degree distributions produced by the Transit-Stub and Tiers generators are not power-laws, the research community has largely dismissed ...

Keywords: degree-based generators, hierarchy, large-scale structure, network topology, structural generators, topology characterization, topology generators, topology metrics

8 GPSR: greedy perimeter stateless routing for wireless networks

Brad Karp, H. T. Kung
August 2000 **Proceedings of the 6th annual international conference on Mobile computing and networking**
Publisher: ACM Press
Full text available: pdf(1.41 MB) Additional Information: full citation, abstract, references, citings

We present Greedy Perimeter Stateless Routing (GPSR), a novel routing protocol for wireless datagram networks that uses the positions of routers and a packet's destination to make packet forwarding decisions. GPSR makes greedy forwarding decisions using only information about a router's immediate neighbors in the network topology. When a packet reaches a region where greedy forwarding is impossible, the algorithm recovers by routing around the perim ...

9 A performance comparison of multi-hop wireless ad hoc network routing protocols

Josh Broch, David A. Maltz, David B. Johnson, Yih-Chun Hu, Jorjeta Jetcheva
October 1998 **Proceedings of the 4th annual ACM/IEEE international conference on Mobile computing and networking**
Publisher: ACM Press
Full text available: pdf(1.64 MB) Additional Information: full citation, references, citings, index terms

10 "Topologies"—distributed objects on multicomputers

Karsten Schwan, Win Bo
May 1990 **ACM Transactions on Computer Systems (TOCS)**, Volume 8 Issue 2
Publisher: ACM Press

Full text available: pdf(3.83 MB) Additional Information: full citation, abstract, references, citings, index terms, review

Application programs written for large-scale multicomputers with interconnection structures known to the programmer (e.g., hypercubes or meshes) use complex communication structures for connecting the applications' parallel tasks. Such structures implement a wide variety of functions, including the exchange of data or control information relevant to the task computations and/or the communications required for task synchronization, message forwarding/filtering under program control, and so o ...

11 Routing networks for distributed hash tables

Gurmeet Singh Manku

July 2003 **Proceedings of the twenty-second annual symposium on Principles of distributed computing**

Publisher: ACM Press

Full text available: pdf(1.22 MB) Additional Information: full citation, abstract, references, citings, index terms

Routing topologies for distributed hashing in peer-to-peer networks are classified into two categories: deterministic and randomized. A general technique for constructing deterministic routing topologies is presented. Using this technique, classical parallel interconnection networks can be adapted to handle the dynamic nature of participants in peer-to-peer networks. A unified picture of randomized routing topologies is also presented. Two new protocols are described which improve average latenc ...

12 Measuring the effects of internet path faults on reactive routing

Nick Feamster, David G. Andersen, Hari Balakrishnan, M. Frans Kaashoek

June 2003 **ACM SIGMETRICS Performance Evaluation Review , Proceedings of the 2003 ACM SIGMETRICS international conference on Measurement and modeling of computer systems SIGMETRICS '03**, Volume 31 Issue 1

Publisher: ACM Press

Full text available: pdf(394.56 KB) Additional Information: full citation, abstract, references, citings, index terms

Empirical evidence suggests that reactive routing systems improve resilience to Internet path failures. They detect and route around faulty paths based on measurements of path performance. This paper seeks to understand *why* and under *what circumstances* these techniques are effective.To do so, this paper correlates end-to-end active probing experiments, loss-triggered traceroutes of Internet paths, and BGP routing messages. These correlations shed light on three questions about Inte ...

13 Formal verification of standards for distance vector routing protocols

Karthikeyan Bhargavan, Davor Obradovi c, Carl A. Gunter

July 2002 **Journal of the ACM (JACM)**, Volume 49 Issue 4

Publisher: ACM Press

Full text available: pdf(350.56 KB) Additional Information: full citation, abstract, references, citings, index terms

We show how to use an interactive theorem prover, HOL, together with a model checker, SPIN, to prove key properties of distance vector routing protocols. We do three case studies: correctness of the RIP standard, a sharp real-time bound on RIP stability, and preservation of loop-freedom in AODV, a distance vector protocol for wireless networks. We develop verification techniques suited to routing protocols generally. These case studies show significant benefits from automated support in reduced ...

Keywords: AODV, Formal verification, HOL, RIP, SPIN, distance vector routing, interactive theorem proving, model checking, network standards, routing protocols

14 Load balanced deadlock-free deterministic routing of arbitrary networks

David J. Pritchard
April 1992 **Proceedings of the 1992 ACM annual conference on Communications**
Publisher: ACM Press
Full text available: pdf(836.41 KB) Additional Information: full citation, abstract, references, index terms

This paper provides efficient algorithms to deadlock-free route arbitrary multiprocessor interconnection networks as follows: 1. An algorithm is derived for fixed directory routing on an arbitrary network topology such that messages will be routed via one of the shortest routes whilst maintaining an even distribution of traffic over the network (assuming that messages are generated and absorbed in an even manner, or two-phase random routing is used).

15 Alternate path routing for multicast

Daniel Zappala
February 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 1
Publisher: IEEE Press
Full text available: pdf(336.78 KB) Additional Information: full citation, abstract, references, index terms

Current network-layer multicast routing protocols build multicast trees based only on hop count and policy. If a tree cannot meet application requirements, the receivers have no alternative. In this paper, we propose a general and modular architecture that integrates alternate path routing with the network's multicast services. This enables individual multicast receivers to reroute a multicast tree according to their needs, subject to policy restrictions. Our design focuses on the two primary co ...

Keywords: alternate path routing, multicast routing, performance evaluation, quality of service (QoS).

16 A simple approximation to minimum-delay routing

Srinivas Vutukury, J. J. Garcia-Luna-Aceves
August 1999 **ACM SIGCOMM Computer Communication Review , Proceedings of the conference on Applications, technologies, architectures, and protocols for computer communication SIGCOMM '99**, Volume 29 Issue 4
Publisher: ACM Press
Full text available: pdf(1.54 MB) Additional Information: full citation, abstract, references, citings, index terms

The conventional approach to routing in computer networks consists of using a heuristic to compute a single shortest path from a source to a destination. Single-path routing is very responsive to topological and link-cost changes; however, except under light traffic loads, the delays obtained with this type of routing are far from optimal. Furthermore, if link costs are associated with delays, single-path routing exhibits oscillatory behavior and becomes unstable as traffic loads increase. On th ...

17 Deriving traffic demands for operational IP networks: methodology and experience

Anja Feldmann, Albert Greenberg, Carsten Lund, Nick Reingold, Jennifer Rexford, Fred True
June 2001 **IEEE/ACM Transactions on Networking (TON)**, Volume 9 Issue 3
Publisher: IEEE Press
Full text available: pdf(212.92 KB) Additional Information: full citation, abstract, references, citings, index terms

Engineering a large IP backbone network without an accurate network-wide view of the traffic demands is challenging. Shifts in user behavior, changes in routing policies, and failures of network elements can result in significant (and sudden) fluctuations in load. In this paper, we present a model of traffic demands to support traffic engineering and performance debugging of large Internet Service Provider networks. By defining a traffic demand as a volume of load originating from an ingres ...

Keywords: Internet, measurement, routing, traffic engineering

18 Low power SOCs and NOCs: High-level power analysis for on-chip networks

Noel Eisley, Li-Shiuan Peh

September 2004 **Proceedings of the 2004 international conference on Compilers, architecture, and synthesis for embedded systems**

Publisher: ACM Press

Full text available: pdf(353.56 KB) Additional Information: full citation, abstract, references, index terms

As on-chip networks become prevalent in multiprocessor systems-on-a-chip and multi-core processors, they will be an integral part of the design flow of such systems. With power increasingly the primary constraint in chips, the tool chain in systems design, from simulation infrastructures to compilers and synthesis frameworks, needs to take network power into account, motivating the need for early-stage communication power analysis.While there has been substantial research in network performance ...

Keywords: link utilization, power analysis, simulation, systems-on-a-chip (SoC)

19 Deriving traffic demands for operational IP networks: methodology and experience

Anja Feldmann, Albert Greenberg, Carsten Lund, Nick Reingold, Jennifer Rexford, Fred True

August 2000 **ACM SIGCOMM Computer Communication Review , Proceedings of the conference on Applications, Technologies, Architectures, and Protocols for Computer Communication SIGCOMM '00**, Volume 30 Issue 4

Publisher: ACM Press

Full text available: pdf(341.59 KB) Additional Information: full citation, abstract, references, citings, index terms

Engineering a large IP backbone network without an accurate, network-wide view of the traffic demands is challenging. Shifts in user behavior, changes in routing policies, and failures of network elements can result in significant (and sudden) fluctuations in load. In this paper, we present a model of traffic demands to support traffic engineering and performance debugging of large Internet Service Provider networks. By defining a traffic demand as a volume of load originating from an ingre ...

20 The network architecture of the Connection Machine CM-5 (extended abstract)

Charles E. Leiserson, Zahi S. Abuhamdeh, David C. Douglas, Carl R. Feynman, Mahesh N. Ganmukhi, Jeffrey V. Hill, Daniel Hillis, Bradley C. Kuszmaul, Margaret A. St. Pierre, David S. Wells, Monica C. Wong, Shaw-Wen Yang, Robert Zak

June 1992 **Proceedings of the fourth annual ACM symposium on Parallel algorithms and architectures**

Publisher: ACM Press

Full text available: pdf(2.00 MB) Additional Information: full citation, references, citings, index terms